

American Public Works Association New Mexico Chapter

Modified Section 121: Plastic Pipe

These Standards amend or supplement the American Public Works Association New Mexico Chapter (NMAPWA) Current Edition as indicated below in red. All sections, which are not so amended or supplemented, remain in full force and effect.

121.1 GENERAL: Plastic pipe for pressure and non-pressure uses shall be manufactured from polyvinyl chloride (PVC), high-density polyethylene (HDPE), or ultra-high molecular weight materials.

121.2 REFERENCES:

121.2.1 American Society for Testing and Materials (ASTM) (Latest Edition):

D1248 Specification for Polyethylene Plastics Molding and Extrusion Materials

D1598 Test Method for Time-to-Failure of Plastic Pipe Under Constant Internal Pressure

D1599 Test Method for Short-Time Hydraulic Failure Pressure of Plastic Pipe, Tubing and Fittings

D1601 Test Method for Dilute Solution Viscosity of Ethylene Polymers

D1693 Test Method for Environmental Stress - Cracking of Ethylene Plastics

D1784 Specifications for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds

D2239 Specifications for Polyethylene (PE) Plastic Pipe (SIDR-PR) Based on Controlled Inside Diameter

D2412 Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading

D2657 Heat-Joining Polyolefin Pipe and Fittings D2737 Specification for Polyethylene (PE) Plastic Tubing

D2737 Specification for Polyethylene (PE) Plastic Tubing.

D3034 Specification for type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings

Add the following:

D3261 Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing

D3350 Specification for Polyethylene Plastics Pipe and Fittings Materials

F477 Specification for Elastomeric Seals (Gaskets) for joining Plastic Pipe

F679 Specification for Poly (Vinyl Chloride) (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings

Add the following:

F714 Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Outside Diameter

F794 Specification for Poly (Vinyl Chloride) (PVC) Large Diameter Ribbed Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter

F894 Specification for Polyethylene (PE) Large Diameter Profile Wall Sewer and Drain Pipe

121.2.2 American Water Works Association (AWWA) (Latest Edition):

Add the following:

C901 Polyethylene (PE) Pressure Pipe and Tubing, 1/2 In. (13 mm) Through 3 In. (76 mm) for Water Service

C900 AWWA Standards for Polyvinyl Chloride (PVC) Pressure Pipe, 4 in. through 12 in. for Water.

American Public Works Association New Mexico Chapter

Modified Section 121: Plastic Pipe

C905 AWWA Standard for Polyvinyl Chloride (PVC) Water Transmission Pipe, Nominal Diameter 14 in through 36 in.

Add the following:

C906 Polyethylene (PE) Pressure Pipe and Fittings, 4 In. (100 mm) Through 63 In. (1,600 mm), for Water Distribution and Transmission.

Delete C909 in its entirety

121.2.3 THIS PUBLICATION:

SECTION 800 WATER TRANSMISSION, COLLECTOR DISTRIBUTION AND SERVICE LINES

SECTION 900 SANITARY AND STORM SEWER FACILITIES.

SECTION 1502 SUBMITTALS

121.3 CERTIFICATION: The CONTRACTOR shall submit certification from the manufacturer of the pipe as specified in Section 1502 as to the pipe material and that the pipe meets or exceeds the required testing. Only pipe manufactured in the United States of America will be acceptable.

121.4 GENERAL PLASTIC PIPE REQUIREMENTS:

121.4.1 POSITIVE IDENTIFICATION: All plastic pipe shall be coded in accordance with the applicable material standard to eliminate future confusion and prevent accidental damage and service interruption of the facilities.

Delete Section 121.4.2 in its entirety and substitute the following:

121.4.2 LINE LOCATOR: See Section 801.9.9 for line locator requirements.

Delete "or PVCO" from 121.4.3.

121.4.3 PIPE STORAGE: All types of plastic pipe shall be stored in a manner that the pipe will not be deformed as recommended by the manufacturer. PVC pipe is subject to potential degradation when exposed to prolonged periods

of sunlight. Material degradation is generally indicated by a discoloration of the pipe. PVC pipe shall be stored inside a building, under a cover or covered up totally. All discolored pipe shall not be installed and shall be immediately removed from the project.

121.4.4 JOINING SYSTEMS:

121.4.4.1 All plastic pipe which is connected to a manhole, junction box, inlet or similar structure shall be installed with an approved manhole connection adapter or water-stop such that each connection is leak-free and that there is no detrimental affect resulting from the material property characteristic differences between the plastic pipe and the structure.

121.4.4.2 BELL AND SPIGOT JOINTS: Pipe with gasket joints shall be manufactured with a socket configuration, which will prevent improper installation of the gasket and will ensure that the gasket remains in place during joining operations. The gasket shall be manufactured from a synthetic elastomer material and shall conform with the requirements of ASTM F477. The spigot end of each joint of pipe shall be marked circumferentially to indicate the proper home mark. Pipe, which is field-cut, shall be chamfered and the home mark identified in accordance with the applicable criteria.

121.4.4.3 HEAT-WELDED JOINTS: HDPE pipe, which is manufactured without the standard bell and spigot joint configuration shall be joined by a heated fusion process in accordance with ASTM D2657.

121.5 MATERIALS AND UTILIZATION:

121.5.1 POLYVINYL CHLORIDE (PVC) AND MOLECULAR ORIENTED POLYVINYL CHLORIDE (PVCO) PRESSURE PIPE:

Delete "and PVCO" and "Also, the material in PVCO pipe shall be in accordance with Molecular Oriented and Polyvinyl Chloride." from 121.5.1.1.

121.5.1.1 The material in PVC pipe shall be in accordance with ASTM D1784.

American Public Works Association New Mexico Chapter

Modified Section 121: Plastic Pipe

121.5.1.2 Pipe shall be suitable for use in the conveyance of water for human consumption. The pipe shall be marked with two seals of the testing agency that certified the pipe material is suitable for potable water use.

Delete "and PVCO" from 121.5.1.3.

121.5.1.3 PVC pipe shall be approved by the Underwriters Laboratories (UL) and be furnished in cast iron pipe-equivalent outside diameters. Joints shall be push-on flexible elastomeric gasketed.

Delete (DR 18) from 121.5.1.4.

121.5.1.4 Pressure pipe shall have a minimum working pressure of 150 psi or as specified on the plans or in the Supplemental Technical Specifications.

121.5.1.5 Pipe lengths shall contain one bell-end or couple with an elastomeric gasket. Gasket shall meet the requirements of ASTM F477. The bell shall be an integral part of the pipe length and have the same strength and DR as the pipe. The spigot pipe end shall be beveled.

Delete "PVCO pressure pipe in sizes 4-inch through 12 inch shall meet the requirements of AWWA C909" from 121.5.1.6.

121.5.1.6 PVC pressure pipe in sizes 4-inch through 12-inch shall meet the requirements of AWWA C900.

121.5.1.7 PVC pressure pipe in sizes 14-inch through 24-inch shall meet the requirements of AWWA C905.

121.5.2 POLYVINYL CHLORIDE (PVC) GRAVITY FLOW PIPE:

121.5.2.1 The material in PVC pipe shall be in accordance with ASTM D1784.

121.5.2.2 PVC gravity flow pipe may be used for sanitary sewer and storm drainage applications for sizes 8-inch and greater, except for installation resulting in a depth of cover (to subgrade elevation) less than 3.1 feet or when the Contract documents specifically prohibit its use.

121.5.2.3 Lateral line connections shall be made at manholes or at factory manufactured saddles or tees only, unless specifically authorized by the ENGINEER.

121.5.2.4 PVC gravity flow pipe in sizes 8-inches through 15-inches shall meet the requirements of ASTM D3034. Only solid wall pipe shall be used. Minimum wall classification shall be SDR 35.

121.5.2.5 PVC gravity flow pipe in sizes 18-inch and larger shall meet the requirements of ASTM F679 or ASTM F794. Minimum pipe stiffness shall be 46 psi.

121.5.2.5.1 Sewer service line connections to this pipe will not be permitted, unless specifically authorized in the plans and/or Supplemental Technical Specifications and/or by the ENGINEER.

Delete Section 121.5.3 in its entirety and substitute the following:

121.5.3 POLYETHYLENE (PE) PIPE FOR GRAVITY SERVICE ONLY:

121.5.3.1 The material in PE pipe shall be in accordance with ASTM D1248.

121.5.3.2 HIGH DENSITY POLYETHYLENE (HDPE) PROFILE WALL GRAVITY FLOW PIPE:

121.5.3.2.1 High-density polyethylene (HDPE), large diameter, profile wall, gravity flow pipe shall meet all general requirements for plastic pipe and shall conform to requirements in ASTM F894 for diameters of 30-inch and larger.

121.5.3.2.2 Minimum wall thickness in pipe waterway shall be RSC 63. When using ASTM D2412 for determining the strength value of pipe, the E' number (E = modulus of soil reaction) shall not exceed 1500 psi. The pipe manufacturer shall provide certification to the CONTRACTOR and ENGINEER that the class of pipe used is adequate for the specific pipe laying conditions, including, but not limited to, depth of bury, soil characteristics and groundwater conditions.

American Public Works Association New Mexico Chapter

Modified Section 121: Plastic Pipe

121.5.3.2.3 Sewer service line connections to this pipe will not be permitted, unless specifically authorized in the plans and/or Supplemental Technical Specifications and/or by the ENGINEER.

121.5.3.2.4 Lateral line connections shall be made at manholes or at factory manufactured tees or saddles only, unless specifically authorized by the Engineer.

121.5.3.3 All water service lines shall be copper per these specifications.

Add the following:

121.5.4 HIGH-DENSITY POLYETHYLENE (HDPE) PIPE FOR GRAVITY AND PRESSURE SERVICE:

121.5.4.1 MATERIALS: Black PE materials used for the manufacture of high-density polyethylene pipe, tube and fittings shall be PE 4710 high density polyethylene meeting ASTM D3350 cell classification 445574C (formerly PE 3408 meeting 345464C per ASTM D3350-02) and shall be listed in the name of the pipe and fitting Manufacturer in PPI (Plastics Pipe Institute) TR-4 with a standard grade HDB rating of 1600 psi at 73°F. The material shall be listed and approved for potable water in accordance with NSF/ANSI 61. Gray PE material, when used, shall be the same except for meeting ASTM D3350 cell classification 445574E. When requested on the order, the Manufacturer shall certify that the materials used to manufacture pipe and fittings meet these requirements.

121.5.4.2 HIGH DENSITY POLYETHYLENE PIPE: Polyethylene pipe shall be manufactured in accordance with AWWA C901 for sizes 1 1/4" through 3" IPS diameters and to the requirements of ASTM D3035. Pipe 4" IPS and DIPS sizes 4" and above shall be manufactured to the requirements of ASTM F714 and AWWA C906. 2" and smaller water service pipe and tubing shall be manufactured in accordance with ASTM D2239 for inside diameter control IPS size or ASTM D2737 for outside diameter control CTS size.

121.5.4.2.1 SERVICE IDENTIFICATION STRIPES FOR IPS SIZED PIPE: IPS pipes shall be black. When requested as an option, IPS pipes shall have four, equally spaced, blue color stripes co-extruded into the pipe outside surface. Stripes

printed on the pipe outside surface shall not be acceptable.

121.5.4.2.2 SERVICE IDENTIFICATION STRIPES FOR DIPS SIZED PIPE: DIPS sized pipes shall have three equally spaced pairs of longitudinal blue color stripes co-extruded into the pipe outside surface. Stripes printed on the outside surface shall not be acceptable.

121.5.4.2.3 MARKING: Pipe shall be marked in accordance with ASTM F714 and/or AWWA C906. Marking shall indicate the pipe's Pressure Rating (PR) and/or Pressure Class (PC).

121.5.4.2.4 HIGH-DENSITY POLYETHYLENE FITTINGS AND CUSTOM FABRICATIONS: Polyethylene fittings and custom fabrications shall be molded or fabricated by an Approved Manufacturer. All fittings and custom fabrications shall be pressure rated for the same internal pressure rating as the mating pipe.

121.5.4.2.5 MOLDED FITTINGS: Molded fittings shall be manufactured and tested in accordance with ASTM D3261 and shall be so marked. Molded fittings shall be tested in accordance with AWWA C906.

121.5.4.2.6 X-RAY INSPECTION: The Manufacturer shall submit samples from each molded fittings production lot to x-ray inspection per project specifications. X-ray inspection procedures shall be used to inspect molded fittings for voids.

121.5.4.2.7 FABRICATED FITTINGS: Fabricated fittings shall be made by heat fusion joining specially machined shapes cut from pipe, polyethylene sheet stock or molded fittings. Fabricated fittings shall be rated for internal pressure service at least equal to the full service pressure rating of the mating pipe. Fabricated fittings shall be tested in accordance with AWWA C906.

121.5.4.2.8 HIGH-DENSITY POLYETHYLENE FLANGE ADAPTERS: Flange adapters shall be made with sufficient through-bore length to be clamped in a butt fusion-joining machine without the use of a stub-end holder. The sealing surface of the flange adapter shall be machined with a series of small v-shaped grooves (serrations).

American Public Works Association New Mexico Chapter

Modified Section 121: Plastic Pipe

121.5.4.2.9 BACK-UP RINGS AND FLANGE BOLTS: Flange adapters shall be fitted with back-up rings that are pressure rated equal to or greater than the mating pipe. The back-up ring bore shall be chamfered or radiused to provide clearance to the flange adapter radius. Flange bolts and nuts shall be Grade 3 or higher.

121.5.4.2.10 MJ ADAPTERS: MJ Adapters 4" through 16" may be provided with optional Stainless Steel Stiffener upon request. MJ Adapters 14" and above shall be provided with Heavy Duty Back-up Ring Kits. All MJ adapters 18" and above must be provided with Stainless Steel stiffeners.

121.5.4.2.11 COMPLIANCE TESTS: MANUFACTURER'S INSPECTION AND TESTING OF THE MATERIALS: In case of conflict with Manufacturer's certifications, the Contractor, Project Engineer, or Owner may request retesting by the Manufacturer or have retests performed by an outside testing service. All retesting shall be at the requestor's expense, and shall be performed in accordance with these Specifications.

121.5.4.3 JOINING:

121.5.4.3.1 HEAT FUSION JOINING: Joints between plain end pipes and fittings shall be made by butt fusion. Joints between the main and saddle branch fittings shall be made using saddle fusion. The butt fusion and saddle fusion procedures used shall be procedures that are recommended by the pipe and fitting Manufacturer. The Contractor shall ensure that persons making heat fusion joints have received training in the Manufacturer's recommended procedure. The Contractor shall maintain records of trained personnel, and shall certify that training was received not more than 12 months before commencing construction. External and internal beads shall not be removed.

121.5.4.3.2 BUTT FUSION OF UNLIKE WALL THICKNESS: Butt fusion shall be performed between pipe ends, or pipe ends and fitting outlets that have the same outside diameter and are not different in wall thickness by more than one Standard DR, for example, SDR 13.5 to SDR

17, or SDR 11 to SDR 13.5. Transitions between unlike wall thickness greater than one SDR shall be made with a transition nipple (a short length of the heavier wall pipe with one end machined to the lighter wall) or by mechanical means or electrofusion. SDRs for polyethylene pipe are 7.3, 9, 11, 13.5, 17, 21, 26, 32.5 and 41.

121.5.4.3.3 HEAT FUSION TRAINING: The City will require that the Contractor provide proof of certification for all personnel involved in the heat fusion process. The certification shall be for the type of heat fusion equipment being used for the specific project. The certification shall be provided by the equipment manufacturer for the equipment used for the specific project.

121.5.4.3.4 JOINING BY OTHER MEANS: High-density Polyethylene pipe and fittings may be joined together or to other materials by means of (a) flanged connections (flange adapters and back-up rings), (b) mechanical couplings designed for joining polyethylene pipe or for joining high-density polyethylene pipe to another material, (c) MJ Adapters or (d) electrofusion. When joining by other means, the installation instructions of the joining device manufacturer shall be observed.

121.5.4.3.5 ID STIFFENER AND RESTRAINT: A stiffener shall be installed in the bore of the high-density polyethylene pipe when an OD compression mechanical coupling is used and when connecting plain end PE pipe to a mechanical joint pipe, fitting or appurtenance. External clamp and tie rod restraint shall be installed where PE pipe is connected to the socket of a mechanical joint pipe, fitting or appurtenance except where an MJ Adapter is used.

121.5.4.4 TESTING:

121.5.4.4.1 FUSION QUALITY: The Contractor shall ensure the field set-up and operation of the fusion equipment, and the fusion procedure used by the Contractor's fusion operator while on site. The City will require the Contractor to verify field fusion quality by making and testing a trial fusion for pipe sizes 12" and smaller. The trial fusion shall be allowed to cool completely before conducting a Bent Strap Test. The bent test straps shall be cut out and tested in accordance with ASTM F2620. If the bent strap test of the trial fusion fails at the joint, the field fusions

American Public Works Association New Mexico Chapter

Modified Section 121: Plastic Pipe

represented by the trial fusion shall be rejected. For pipe sizes greater than 12" the Contractor shall provide field tensile testing of the joint to verify joint integrity. Contractor's personnel shall be certified in the use of all equipment used for performing the field tensile test. Certification shall be by the equipment manufacturer for the specific equipment used for the project. The Contractor, at his expense, shall make all necessary corrections to equipment, set-up, operation and fusion procedure, and shall re-make the rejected fusions.

121.6 MEASUREMENT AND PAYMENT: Plastic pipe used for both pressure and gravity flow shall be measured and paid for at the contract unit pipe as specified in Section 800 and 900 and/or as defined in the Bid Proposal.